



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/512,134	10/13/2005	Uwe Guntow	62163(45107)	9190
21874 7590 12/23/2009 EDWARDS ANGELL PALMER & DODGE LLP P.O. BOX 55874 BOSTON, MA 02205				
EXAMINER				
LAIOS, MARIA J				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
12/23/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/512,134

**Applicant(s)**

GUNTOW ET AL.

**Examiner**

MARIA J. LAIOS

**Art Unit**

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) \_\_\_\_ is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5 and 7-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/CD)  
Paper No(s)/Mail Date \_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

### DETAILED ACTION

1. This office action is in response to the remarks submitted 21 August 2009.

Claims 1, 2, 4, 5 and 7-11 are currently pending and finally rejected for reasons of record.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Claim Rejections - 35 USC § 103***

3. Claim 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Bogicevic et al. (US 6,495,279 B1).

As to claims 1 and 2, Ivers-Tiffée et al. discloses a high temperature solid electrolyte fuel cell comprising an electrolyte layer between two electrode layers (Figure 12), the electrolyte particles of scandium or yttrium doped zirconium (Table 2, page 1807) on an electrolyte substrate and depositing a nano-porous electrode thin layer by MOD process (page 1809, col. 2 lines 20-25). Ivers-Tiffée et al. fails to disclose an electrolyte boundary layer on the structured electrolyte layer having a thickness of 100 - 500 nm.

Bogicevic et al. discloses a solid oxide fuel cell and teaches an interlayer (electrolyte boundary layer) is placed between the electrodes and the electrolyte with a

thickness of 0.001 to about 1 micron to improve the power density (col. 2 lines 57-59). It would have been obvious to one of ordinary skill in the art at the time of the invention to include the interlayer of Bogicevic et al. to the fuel cell of Ivers-Tiffée et al. in order to improve the power density.

Claims 1-2, 4-9 and 11 are considered product by process claims. The claims refer to a high-temperature solid electrolyte fuel cell. Therefore the fuel cell only requires an electrolyte layer, an electrolyte boundary layer, and two electrodes. The electrolyte layer is yttrium or scandium doped zirconium dioxide.

The product-by-process limitations of claims are not given patentable weight since the courts have held that patentability is based on a product itself, even if the prior art product is made by a different process (In re Thorpe, 227 USPQ 964, 1985). Moreover, a product-by-process limitation is held to be obvious if the product is similar to a prior art product (In re Brown, 173 USPQ 685, and In re Fessman, 180 USPQ 324). Claim 1-2, 4-9 and 11 as written does not distinguish the product of the instant application from the product of the prior art.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Bogicevic et al. (US 6,495,279 B1) as applied above to claim 1, and further in view of Herbstritt et al. (Cathode Performance: Influence of MOD-Intermediate Layer and Electrolyte Surface

Enlargement, *Proceedings of the Fourth European Solid Oxide Fuel Cell Conference*, 10<sup>th</sup> – 14<sup>th</sup> July 2000, Lucerne, Switzerland, 2000, pp. 697-706).

As to claim 4, Ivers-Tiffée modified by Bogicevic et al. disclose the electrolyte particles of Sc-doped ZrO<sub>2</sub> and Gd doped CeO<sub>2</sub> and YSZ (Table 2, page 1807) on an electrolyte substrate and depositing a nano-porous electrode thin layer by MOD process (page 1809, col. 2 lines 20-25) but fails to disclose screen printing the electrolyte particles and the screen printing paste has a solid content of 10-30 weight percent.

Herbstritt et al. discloses that the 8YSZ particle content in the screen-printing paste was adjusted to get an effective electrolyte surface enlargement of 25 percent (Page 699). However, Herbstritt et al does not disclose that screen-printing paste has a solid content of 10-30 weight percent. Herbstritt et al. is clearly teaching that the content of electrolyte particle (which is a solid) is a results effective variable that that controls the effective electrolyte surface enlargement. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have 10-30 weight percent of scandium stabilized zirconium or yttrium stabilized zirconium particle in the screen printing paste because it has been held by the courts that optimization of a results effective variable is not novel. *In re Boesch*, 617 F2d 272, 205 USPQ 215 (CCPA 1980).

5. Claims 5, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Bogicevic et al. (US

6,495,279 B1) as applied above to claim 1, and further in view of Herbstritt et al. (Increased Cathode Performance using a Structured Electrolyte Surface, *Electrochemical Society Proceedings*, Volume: 99-19, 1999, pp. 972-980, hereinafter Herbstritt 2).

As to claim 5, Ivers-Tiffée modified by Bogicevic et al disclose the fuel cell as is discussed above and incorporated herein but fail to disclose the particle size of the electrolytic material as 5-20 microns.

Herbstritt 2 discloses an electrolytic material (8YSZ) having particle of ~ 17 microns (abstract). Herbstritt 2 teaches increasing the electrolyte surface area leads to a decrease in the cathode resistance (page 697, First paragraph of the introduction) which leads to an increase performance of the fuel cell. It would have been obvious to one of ordinary skill in the art at time of the invention to have the electrolyte of Ivers-Tiffée have a particle size of ~ 17 microns of Herbstritt because this leads to a decrease in the cathode resistance.

As to claim 8, Ivers-Tiffée modified by Bogicevic et al discloses the electrode as discussed above and incorporated herein. Ivers-Tiffée discloses LSM as the electrode but fails to disclose the material as ULSM. Herbstritt 2 discloses the electrode material for a SOFC as ULSM and LSM (Abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the LSM of Ivers-Tiffée with the ULSM of Herbstritt because both are known to be effective active materials for SOFCs and the references teaches that they are art recognized equivalents for the same purpose. See MPEP 2144.06.

As to claim 11, Herbstritt 2 further discloses the ULSM coating solution having a content of 11-12 percent which will lead to high electrical conductivity (page 699 lines 19-25) when applying the MOD method. It would have been obvious to one of ordinary skill in the art at the time of the invention to have the coating content of the ULSM to be 11-12 percent because Herbstritt teaches that this leads to high electrical conductivity when applied by the MOD method.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Bogicevic et al. (US 6,495,279 B1) as applied above to claim 1, and further in view of Chen et al. (US 6,645,656 B1).

As to claim 7, Ivers-Tiffée modified by Bogicevic et al disclose the cathode material as LSM (page 1806 col. 2 last paragraph) but fails to disclose the LSC electrode compound. Chen et al. teaches a solid oxide fuel cell in which a thin film of  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$  is applied by MOD on top of an YSZ layer (col. 5 lines 16-23 and col. 2 lines 28-31) and that LSM (ULSM  $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$ ), a widely used cathode material can also be used (col. 6 lines 28-30).

It would have been obvious to one of ordinary skill at the time of the invention to replace the LSM of Ivers-Tiffée with the  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$  of Chen because LSM and  $\text{La}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$  are known to be effective active materials for SOFC and the reference

teaches that they are art recognized equivalents for the same purpose. See MPEP 2144.06.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811), Bogicevic et al. (US 6,495,279 B1) and Chen et al. (US 6,645,656 B1) as applied to claim 7 above, and further in view of Herbstritt et al. (Increased Cathode Performance using a Structured Electrolyte Surface, *Electrochemical Society Proceedings*, Volume: 99-19, 1999, pp. 972-980, hereinafter Herbstritt 2).

As to claim 9, Ivers-Tiffée et al. modified by Bogicevic et al. and Chen fail to disclose the mass percent in the coating solution.

Herbstritt 2 teaches the concentration of the coating solution as 11 to 12 percent (Page 974 line 9) for coating the material onto the electrolyte thereby producing perovskite structure. This MOD layer exhibit high electrical conductivity (page 974 lines 7-17). It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the concentration of the coating solution of Ivers-Tiffée modified by Bogicevic et al. and Chen to be between 11-12 percent because Herbstritt 2 teaches that this concentration of the coating solution will eventually lead to an electrode structure having high electrical conductivity.



8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ivers-Tiffée et al. ("Material and technologies for SOFC-Components, *Journal of the European Ceramic Society*, 2001, pp 1805-1811) in view of Herbstritt et al. (Increased Cathode Performance using a Structured Electrolyte Surface, *Electrochemical Society Proceedings*, Volume: 99-19, 1999, pp. 972-980, hereinafter Herbstritt 2), et al. (US 5,543,239), Bogicevic et al. (US 6,495,279 B1) and Van Berkel et al. (US 2002/0031694 A1) .

As to claim 10, Ivers-Tiffée et al discloses the electrolyte particles of Sc-doped  $ZrO_2$  and YSZ (Table 2, page 1807) on an electrolyte substrate and depositing a nanoporous electrode thin layer by MOD process (page 1809, col. 2 lines 20-25) but fails to disclose screen printing the electrolyte particles onto an unsintered electrolyte.

Herbstritt 2 teaches screen printing the electrolyte onto an unsintered electrolyte substrate and then sintering the structure increases the contact between the electrolyte particles and the substrate (Page 975 paragraph 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to screen print the electrolyte of Ivers-Tiffée onto an unsintered electrolyte substrate because Herbstritt et al. teaches this increases the contact between the electrolyte particles and the substrate.

Ivers-Tiffée et al. modified by Herbstritt et al. fail to disclose an electrolyte boundary layer on the structured screen printed electrolyte layer obtained where the electrolyte boundary layer is applied by and MOD process and has a thickness of 100-500 nm.

Bogicevic et al. discloses a solid oxide fuel cell and teaches an interlayer (electrolyte boundary layer) is placed between the electrodes and the electrolyte with a thickness of 0.001 to about 1 micron to improve the power density (col. 2 lines 57-59). It would have been obvious to one of ordinary skill in the art at the time of the invention to include the interlayer of Bogicevic et al. to the fuel cell of Ivers-Tiffée et al. in order to improve the power density.

Bogicevic et al. discloses the porous electrolyte layer but fails to state the method of applying this layer. Van Berkel et al. teach the layer thickness of a solid electrolyte can be reduced and the conductivity can be enhanced by MOD spin casting (Paragraph 87). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the layer of Bogicevic et al deposited on the sintered electrolyte of Ivers-Tiffée et al. by MOD spin casting because this reduces the conductivity.

### ***Response to Arguments***

9. Applicant's arguments filed 21 August 2009 have been fully considered but they are not persuasive.

*Applicant argues that the process of applying the electrolyte boundary layer by the method of MOD is critical in order to obtain the claimed product (for claims 1, 2, 4, 5, 7-9 and 11).*

The product-by-limitations of claim 1 are not given patentable weight since the courts have held that patentability is based on a product itself, even if the prior art

product is made by a different process (In re Thorpe, 227 USPQ 964, 1985). Moreover, a product-by-process limitation is held to be obvious if the product is similar to a prior art product (In re Brown, 173 USPQ 685, and In re Fessman, 180 USPQ 324). Claim 1 as written does not distinguish the product of the instant application from the product of the prior art. Applicant has only stated that the MOD process is critical to the product but has not provided any evidence of this and has only stated that other processes of applying thin film are not equivalent. Again Applicant has not provided evidence of this. Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

*Furthermore Applicant is arguing that Bogicevic et al. applies an interlayer that is applied on a smooth surface and not an irregular layer.*

Applicant has not claimed an irregular surface in claim 1.

It is noted that claim 10 is the process claim in which the Examiner has addressed the process of screen printing, sintering, depositing a electrode layer by a sol-gel or MOD process and applying the boundary layer by the MOD process and claim 1 is a product claim which requires a high-temperature solid electrolyte fuel cell. And the fuel cell only requires an electrolyte layer, an electrolyte boundary layer, and two electrodes in which the electrolyte layer is yttrium or scandium doped zirconium dioxide.

10. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In this case the method of applying the boundary layer (which is an electrolyte material) by MOD (for claim 10) is known to one of ordinary skill as is taught by Van Berkel et al.

### ***Conclusion***

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARIA J. LAIOS whose telephone number is (571)272-9808. The examiner can normally be reached on Monday - Thursday 10 am -7 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. L./  
Examiner, Art Unit 1795

/Dah-Wei D. Yuan/  
Supervisory Patent Examiner, Art Unit 1795